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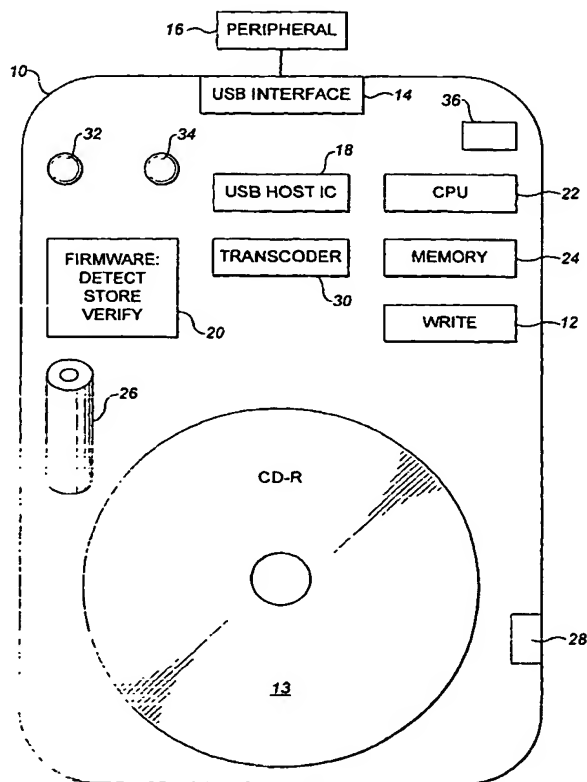
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[Continued on next page]

(54) Title: DIRECT CONNECTION OF A DATA STORAGE DEVICE AND A CONSUMER ELECTRONIC DEVICE



(57) Abstract: An optical data storage device (10) adapted to act as a "host" or master on a peripheral interface (14) (e.g. Universal Serial Bus) allows easy (automatic and single button activated) storage of data from a consumer electronic device (16) such as Digital Still Camera (DSC) directly connected to the device on a standard optical storage medium (13) such as CD-R without the need for a (10) personal computer. The images are decompressed and stored (11) within the drive memory (22), re-compressed into a standard format, MPEG-1 (transcoded). The transcoded images are recorded onto the optical medium (13) in a format where each still image is written as a separate image frame. The standard format is compatible with the Video CD (or VCD) standard. This invention also provides a device comprising two peripheral interfaces and adapted (18) to act as a host on both, so that the separate or other form of data storage device including HDD or flash memory can be used.

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Direct connection of a Data Storage device and a consumer
electronic device

1

2 This invention relates to data storage, in particular
3 interface control and data recording for optical and
4 other types of storage devices.

5

6 The storage of data files of all varieties on optical
7 storage medium currently requires the use of a personal
8 computer to control the interface between the storage
9 medium and the source of the data to be stored. The
10 present invention removes the requirement for the
11 personal computer. Additionally the invention can be used
12 to connect other forms of data storage.

13

14 The growth in digital consumer electronic devices over
15 the last 5 years has been explosive. Increasing features
16 available to the consumer has driven this growth. If the
17 example of digital still camera (DSC) is considered, the
18 consumer has been attracted by the ability to instantly
19 view, delete and in some cases modify the pictures they
20 have just taken, without the need for a "developing"
21 stage. The consumer can further produce "photo quality"

1 images with a low cost printer, connected to a personal
2 computer (PC). Recent developments have seen the
3 introduction of stand-alone printers, which can connect
4 directly to a DSC, or can have the flash media typically
5 used for the cameras connected directly to it. This
6 removes the requirement for a PC for the printing images.

7
8 Archiving of the digital images produced is not done
9 within the DSC or the flash media used within these
10 cameras, due to the high costs, and limited size.
11 Therefore the digital images are typically transferred to
12 a PC for storage on a Hard Disc Drive (HDD), and are
13 ultimately archived / backed-up in the form of optical
14 data storage in a typical application.

15
16 There are two major problems for owners of digital
17 cameras, namely the capacity size and cost of proprietary
18 flash media cards that come with the digital cameras that
19 they buy, and the ease of sharing and displaying the
20 final images they have captured. This is due to lack of a
21 "standard" and limitations of consumer electronics (CE)
22 device compatibility.

23
24 It would be advantageous to remove the need for a
25 personal computer to control the data transfer and the
26 associated user intervention.

27
28 It is an object of the present invention to provide
29 direct connection of a storage device (such as a CD-RW or
30 DVD RW drive or an HDD or flash memory) and a consumer
31 electronic device.

32

1 According to a first aspect of the present invention,
2 there is provided a storage device adapted to act as a
3 "host" or master on a peripheral interface.
4

5 Preferably the storage device is an optical storage
6 device.
7

8 Preferably there is provided a device comprising the
9 storage device.
10

11 According to a second aspect of the present invention,
12 there is provided device comprising:

13 a data writing means (12) to write data to a storage
14 medium (13); and

15 a peripheral interface (14) for data transfer with a
16 peripheral device (16) wherein the device acts as
17 the "host".
18

19 According to a third aspect of the present invention,
20 there is provided a device, adapted to act as a "host" or
21 master on a peripheral interface wherein the device is
22 further adapted to automatically detect a connected
23 peripheral and transfer data from the connected
24 peripheral to a storage medium.
25

26 Preferably the device comprises:

27 a first peripheral interface (14) for data transfer
28 with a peripheral device (16); and

29 a second peripheral interface (14) for data transfer
30 with a storage device (38);

31 wherein the device is adapted to act as "host" or master
32 on the first and second peripheral interfaces.
33

1 Typically the storage medium is an optical medium.
2
3 Preferably the optical medium is an optical disc.
4
5 Optionally the device is further adapted to automatically
6 delete the transferred file on the peripheral.
7
8 Optionally the device is further adapted to transfer the
9 data responsive to a single user input.
10
11 Optionally the device is further adapted to verify the
12 data transfer responsive to a single user input.
13
14 Optionally the device is further adapted to delete the
15 transferred file responsive to a single user input.
16
17 Preferably the single user input is a single button press
18 on the device.
19
20 Preferably a button on the device is dedicated to
21 triggering one of: transferring, verifying or deleting
22 data.
23
24 Preferably the device further comprises a peripheral
25 interface host module (18) for providing host functions.
26
27 Preferably the host module is controlled by a firmware or
28 coding module (20).
29
30 Preferably the format of the peripheral interface is a
31 format for the transfer of data from peripheral device to
32 a PC.
33

1 Optionally the device further comprises memory and the
2 data comprises images and the device is further adapted
3 to store decompressed images within the memory (22),
4 transcoded into a standard format.

5

6 Preferably the transcoded images are recorded onto the
7 storage medium in a format where each still image is
8 written as a separate image frame.

9

10 Preferably the device is further adapted to transcode
11 data received by peer to peer transfer and produce
12 storage media of standard format.

13

14 Preferably the device further comprises a transcoder
15 module (30) for converting data received from the
16 peripheral device from a first format to a second format.

17

18 Optionally the device is adapted to save to the storage
19 medium the data received from the peripheral device
20 transcoded or copied directly into a plurality of
21 formats.

22

23 Preferably the storage medium is an optical disc which is
24 multi-session disc and each format is saved as a separate
25 session.

26

27 According to a fourth aspect of the present invention,
28 there is provided a method of storing data comprising the
29 steps:

30

automatically detecting the connection of a
31 peripheral;

32

receiving data from the connected peripheral; and

33

transferring the data to a storage medium.

1

2 Typically the storage medium is an optical medium.

3

4 Preferably the step of transferring is automatic.

5

6 Alternatively the step of transferring is responsive to a
7 single user input.

8

9 Optionally the method further comprises the step of
10 verifying the transferred file on the peripheral.

11

12 Preferably the step of verifying is automatic.

13

14 Alternatively the step of verifying is responsive to a
15 single user input.

16

17 Optionally the method further comprises the step of
18 deleting the transferred file on the peripheral.

19

20 Preferably the step of deleting is automatic.

21

22 Alternatively the step of deleting is responsive to a
23 single user input.

24

25 Preferably the single user input is a single button
26 press.

27

28 Preferably the single user input is a single button press
29 on a button dedicated to triggering one of: transferring,
30 verifying or deleting data.

31

1 Optionally the the data comprises an image and the method
2 further comprises the steps of decompressing an image and
3 transcoding it into a standard format.

4

5 Preferably the method further comprises the step of
6 recording a plurality of transcoded images onto the
7 storage medium in a format where each still image is
8 written as a separate image frame.

9

10 Preferably the method further comprises the steps of
11 transcoding data received by peer to peer transfer and
12 producing storage media of standard format.

13

14 Optionally the method further comprises the step of
15 saving to the storage medium the data received from the
16 peripheral device transcoded or copied directly into a
17 plurality of formats.

18

19 Preferably the method further comprises the step of
20 saving each format as a separate session on a multi-
21 session optical disc.

22

23 In order to provide a better understanding of the present
24 invention, an embodiment will now be described by way of
25 example only and with reference to the accompanying
26 drawings, in which:

27

28 Figure 1 illustrates, in schematic form a storage device,
29 in accordance with a preferred embodiment of the present
30 invention.

31

1 Figure 2 illustrates, in schematic form a device with a
2 separate storage device, in accordance with an
3 alternative embodiment of the present invention.
4

5 The invention is an optical data storage device which can
6 act as a "Host" or master device on a user interface
7 (e.g. Universal Serial Bus - USB). Once the device can
8 act as host, data files can be requested from the data
9 source (e.g. a digital camera or Personal Data Assistant
10 - PDA), and stored on the optical medium such as an
11 optical disc without the need for a personal computer.
12 This is known as peer to peer communications.
13

14 The invention also includes a method of transcoding data
15 files received during peer-peer communications between an
16 optical data storage device and a consumer electronic
17 device, allowing the creation of an easily readable
18 standard format data disc. The data disc produced can be
19 in a number of formats. An example of an application is
20 the creation of a Video Disc (standard format from
21 Philips-Sony), or an ISO9660 disc which is again a
22 standard format. An additional example would be the
23 creation of a "multi-session" disc which had a session in
24 the Video Disc format, and a session in the ISO9660
25 format. VCD allows maximum compatibility with consumer
26 electronic devices, such as DVD-Video players.
27

28 With reference to Figure 1, the optical data storage
29 device (10) is shown. The device comprises:

30 a data writing means (12) to write data to an
31 optical disc (13);
32 a peripheral interface (14) for data transfer to a
33 peripheral device (16); and

1 wherein the optical data storage device acts as the
2 "host".

3

4 The optical data storage device comprises a peripheral
5 interface host module (18) for providing host functions.
6 This is a USB Host IC. The host module is controlled by a
7 firmware stack or coding module (20).

8

9 The embedded firmware within the device allows automatic
10 detection of a connected digital camera (or other storage
11 device), and can be set-up to operate automatically, with
12 the detected file stored to the destination drive (e.g.
13 CDR) on detection of the camera. The device can further
14 automatically verify that the written files match the
15 source files, by performing a bit - bit compare. Another
16 mode of operation requires the user to push a single
17 button (32) after detection of the source (e.g. digital
18 camera). This single button push enables the transfer of
19 the data files and verification. A further mode of
20 operation requires a button for data transfer (32) and
21 one for verification (34). The buttons may be dedicated
22 or soft keys. The status of the firmware (search for
23 devices, transfer of data, verification) can be displayed
24 via tri-colour LED's or via an LCD interface (36). The
25 images may be deleted from the source device
26 automatically or on a button press.

27

28 The embedded firmware is optimised to run on a low cost /
29 low power processor (e.g. ARM7). The firmware comprises
30 of an operating system which allows detection of the
31 source of the data, as well as controlling the file
32 structure creation on the destination storage (e.g. CD-

1 R). This reduces the part count required and allows
2 operation on low cost, portable products.

3

4 The format of the peripheral interface is a format for
5 the transfer of data from peripheral device to a PC. The
6 peripheral interface is the Universal Serial Bus, version
7 1.1 or Universal Serial Bus version 2.0.

8

9 The unit is powered from a battery supply (26) or via the
10 peripheral connector (14) or from a separate supply (28).

11

12 The images are stored on the optical media in a format
13 conforming to the ISO9660 standard.

14

15 The images are decompressed and stored within the drive
16 memory (22), re-compressed into a standard format, MPEG-1
17 (transcoded).

18

19 Alternatively, the images may be transferred directly to
20 the disc via the drive memory (22).

21

22 The transcoded images are recorded onto the optical media
23 (13) in a format where each still image is written as a
24 separate image frame. The standard format is compatible
25 with the Video CD (or VCD) standard.

26

27 The peripheral device is a device which transfers digital
28 data to a PC, e.g. a Digital Still Camera (DSC), a
29 digital video camera, a personal digital assistant (PDA)
30 or a mobile phone.

31

32 The device is further adapted to transcode data received
33 by peer to peer transfer and produce optical discs of

1 standard format. For this, the device further comprises a
2 transcoder module (30) for converting data received from
3 a peripheral from a first format to a second format.

4

5 The device is adapted to save to a disc (13) with the
6 data received from a peripheral transcoded or copied
7 directly into a plurality of formats. The discs may be
8 multi-session discs with each format is saved as a
9 separate session. Additionally the recording may span a
10 number of discs if the required size is larger than a
11 single disc.

12

13 The preferred embodiment is portable CD-RW with image
14 download capability. The invention enables users to
15 connect any USB digital stills camera directly to
16 portable devices enabled with image download capability,
17 such as 12cm "Calypso" and 8cm "Samba" portable CDR and
18 CD-RW devices from Infinite Data Storage Ltd.,
19 Dunfermline, UK.

20

21 The present invention enables low cost CD storage and
22 file sharing for users on the move. On a family holiday,
23 there's no need to restrict the number of pictures you
24 keep.

25

26 Instead of using expensive replacement flash cards or
27 taking a laptop PC, you can burn as many as you like
28 directly from your digital camera to CDs that cost as
29 little as 50 cents each. You can use the CDs to archive
30 your photos, and what's more they can be format
31 compatible with your home DVD player, so you can simply
32 view your images direct on a TV. No more PC.

33

1 The digital image download technology enables consumers
2 with USB cameras to easily save images on very low cost
3 media that can be accessed on a variety of PC and CE
4 devices. Embedded software image format conversion in the
5 CD-RW drive allows the creation of images on VCD or ISO
6 9660 compatible discs that can be played on any CD/DVD
7 player or recorder. In addition the inclusion of
8 MultiPhotoVideo compatibility further eases the accessing
9 of pictures on home DVD video players. Applications that
10 are normally only possible on PCs such as the mastering
11 and burning of CDs can be completed on an embedded
12 processor (22) such as the ARM7tdmi used in accordance
13 with the present invention.

14

15 Thus the present invention allows easy storage of data on
16 a standard optical storage medium without the need for a
17 personal computer.

18

19 The present invention allows the creation of standard
20 disc formats for data storage, without the need for a
21 personal computer.

22

23 The present invention allows the creation of multi-
24 session discs with the same data stored in different
25 formats to maximise compatibility.

26

27 One example of application is the backup of digital
28 images from a digital camera, whilst the user is
29 travelling or unable to access a personal computer, or is
30 looking for ease of use.

31

32 This invention removes the need for the PC, and allows
33 creation of a copy and archival of the images produced

1 within the camera on an optical medium. Additionally the
2 images can be stored in different formats to allow easy
3 use and inter-changeability of the stored images. Typical
4 examples are storing the images in JPEG format (typical
5 format of images from a DSC) and ISO9660 standard file
6 structure. The ISO9660 standard allows easy interchange
7 between types of PC (e.g. Intel based and Apple
8 computers). Also provided according to the present
9 invention is the ability to convert between one image
10 encoding standard and another (transcoding), for example
11 JPEG into an MPEG standard format, and the subsequent
12 creation and recording of the files in a Video CD (or
13 VCD) format/standard. The VCD format/standard allows the
14 still images to be viewed within for example a suitably
15 enabled DVD video player, thus removing the requirement
16 for the DSC owner to also own a PC. Additionally this
17 invention allows the creation of multiple copies of the
18 same data for sharing etc.

19

20 The example given above is that for a DSC, but this could
21 equally apply to other CE devices, such as personal
22 digital assistants (PDA) or digital video cameras. Other
23 CE devices that also connect and transfer digital data,
24 images or audio could also be connected directly to such
25 an optical data storage device.

26

27 Numerous other embodiments can be envisaged. For example,
28 with reference to Figure 2, simplification of the above
29 embodiment can provide a device not having the data
30 writing components (38) that comprise the data writing
31 means (40), the optical disc (42) and the drive means for
32 driving the disc (not shown). That is, the device
33 comprises the peripheral interface (14), the peripheral

1 interface host module (18), the firmware stack or coding
2 module (20), the drive memory (22), the memory (24), the
3 transcoder module (30), the battery supply (26) and
4 separate supply (28), the buttons (32,34) and the display
5 (36). The device further comprises at least one of
6 another peripheral interface (44) like the above
7 peripheral interface (14) in order to connect to another
8 separate peripheral device, i.e. a data storage device
9 such as CD-R or CD-RW drive, DVD or DVD-RW drive or
10 recorder, HDD, or flash memory. The device acts as a host
11 on both peripheral interfaces, and therefore control the
12 separate data storage device (38) as well as the
13 peripheral device (16) such as a Digital Still Camera.

14
15 This embodiment allows a use of various types of data
16 storage devices including existing peripheral devices for
17 PC. This is advantageous because the user can choose
18 preferable one according to his purpose, and cost would
19 be lower as the user can use the peripheral device which
20 he has already had, and as the device itself would be
21 simplified. Of course this embodiment does not diminish
22 any advantages above-mentioned.

23
24 Further modifications and improvements may be added
25 without departing from the scope of the invention herein
26 described.

1 Claims

- 2 1. A storage device adapted to act as a "host" or master
3 on a peripheral interface.
4
- 5 2. The storage device of Claim 1 wherein the storage
6 device is an optical storage device.
7
- 8 3. A device comprising the storage device of any of Claims
9 1 or 2.
10
- 11 4. A device comprising:
12 a data writing means (12) to write data to a storage
13 medium (13); and
14 a peripheral interface (14) for data transfer with a
15 peripheral device (16) wherein the device acts as
16 the "host".
17
- 18 5. A device, adapted to act as a "host" or master on a
19 peripheral interface wherein the device is further
20 adapted to automatically detect a connected peripheral
21 and transfer data from the connected peripheral to a
22 storage medium.
23
- 24 6. The device of Claim 5 comprising:
25 a first peripheral interface (14) for data transfer
26 with a peripheral device (16); and
27 a second peripheral interface (14) for data transfer
28 with a storage device (38);
29 wherein the device is adapted to act as "host" or
30 master on the first and second peripheral interfaces.
31
- 32 7. The device of any of Claims 3 to 6 wherein the storage
33 medium is an optical medium.

1

2 8. The device of Claim 7 wherein the optical medium is an
3 optical disc.

4

5 9. The device of any previous Claim wherein the device is
6 further adapted to automatically delete the transferred
7 file on the peripheral device.

8

9 10. The device of any previous Claim wherein the device
10 is further adapted to transfer the data responsive to a
11 single user input.

12

13 11. The device of any previous Claim wherein the device
14 is further adapted to verify the data transfer
15 responsive to a single user input.

16

17 12. The device of any previous Claim wherein the device
18 is further adapted to delete the transferred file
19 responsive to a single user input.

20

21 13. The device of any of Claims 10 to 12 wherein the
22 single user input is a single button press on the
23 device.

24

25 14. The device of any previous Claim wherein a button on
26 the device is dedicated to triggering one of:
27 transferring, verifying or deleting data.

28

29 15. The device of any previous Claim wherein the the
30 device further comprises a peripheral interface host
31 module (18) for providing host functions.

32

1 16. The device of Claim 14 wherein the the host module
2 is controlled by a firmware or coding module (20).
3

4 17. The device of any of Claims 15 to 16 wherein the
5 format of the peripheral interface is a format for the
6 transfer of data from peripheral device to a PC.
7

8 18. The device of any previous Claim wherein the device
9 further comprises memory and the data comprises images
10 and the device is further adapted to store decompressed
11 images within the memory (22), transcoded into a
12 standard format.
13

14 19. The device of Claim 18 wherein the transcoded images
15 are recorded onto the storage medium in a format where
16 each still image is written as a separate image frame.
17

18 20. The device of any previous Claim wherein the device
19 is further adapted to transcode data received by peer
20 to peer transfer and produce storage media of standard
21 format.
22

23 21. The device of any previous Claim wherein the device
24 further comprises a transcoder module (30) for
25 converting data received from the peripheral device
26 from a first format to a second format.
27

28 22. The device of any previous Claim wherein the device
29 is adapted to save to the storage medium the data
30 received from the peripheral device transcoded or
31 copied directly into a plurality of formats.
32

1 23. The device of Claim 22 wherein the storage medium is
2 an optical disc which is multi-session disc and each
3 format is saved as a separate session.
4

5 24. A method of storing data comprising the steps:
6 automatically detecting the connection of a
7 peripheral;
8 receiving data from the connected peripheral; and
9 transferring the data to a storage medium.
10

11 25. The method of Claim 24 wherein the storage medium is
12 an optical medium.
13

14 26. The method of any of Claims 24 to 25 wherein the
15 step of transferring is automatic.
16

17 27. The method of any of Claims 24 to 26 wherein the
18 step of transferring is responsive to a single user
19 input.
20

21 28. The method of any of Claims 24 to 27 wherein the
22 method further comprises the step of verifying the
23 transferred file on the peripheral.
24

25 29. The method of any of Claims 24 to 28 wherein the
26 step of verifying is automatic.
27

28 30. The method of any of Claims 24 to 29 wherein the
29 step of verifying is responsive to a single user input.
30

31 31. The method of any of Claims 24 to 30 wherein the
32 method further comprises the step of deleting the
33 transferred file on the peripheral.

1

2 32. The method of any of Claims 24 to 31 wherein the
3 step of deleting is automatic.

4

5 33. The method of any of Claims 24 to 32 wherein the
6 step of deleting is responsive to a single user input.

7

8 34. The method of any of Claims 24 to 33 wherein the
9 single user input is a single button press.

10

11 35. The method of Claim 34 wherein the single user input
12 is a single button press on a button dedicated to
13 triggering one of: transferring, verifying or deleting
14 data.

15

16 36. The method of any of Claims 24 to 35 wherein the
17 data comprises an image and the method further
18 comprises the steps of decompressing an image and
19 transcoding it into a standard format.

20

21 37. The method of any of Claims 24 to 36 wherein the
22 method further comprises the step of recording a
23 plurality of transcoded images onto the storage medium
24 in a format where each still image is written as a
25 separate image frame.

26

27 38. The method of any of Claims 24 to 37 wherein the
28 method further comprises the steps of transcoding data
29 received by peer to peer transfer and producing storage
30 media of standard format.

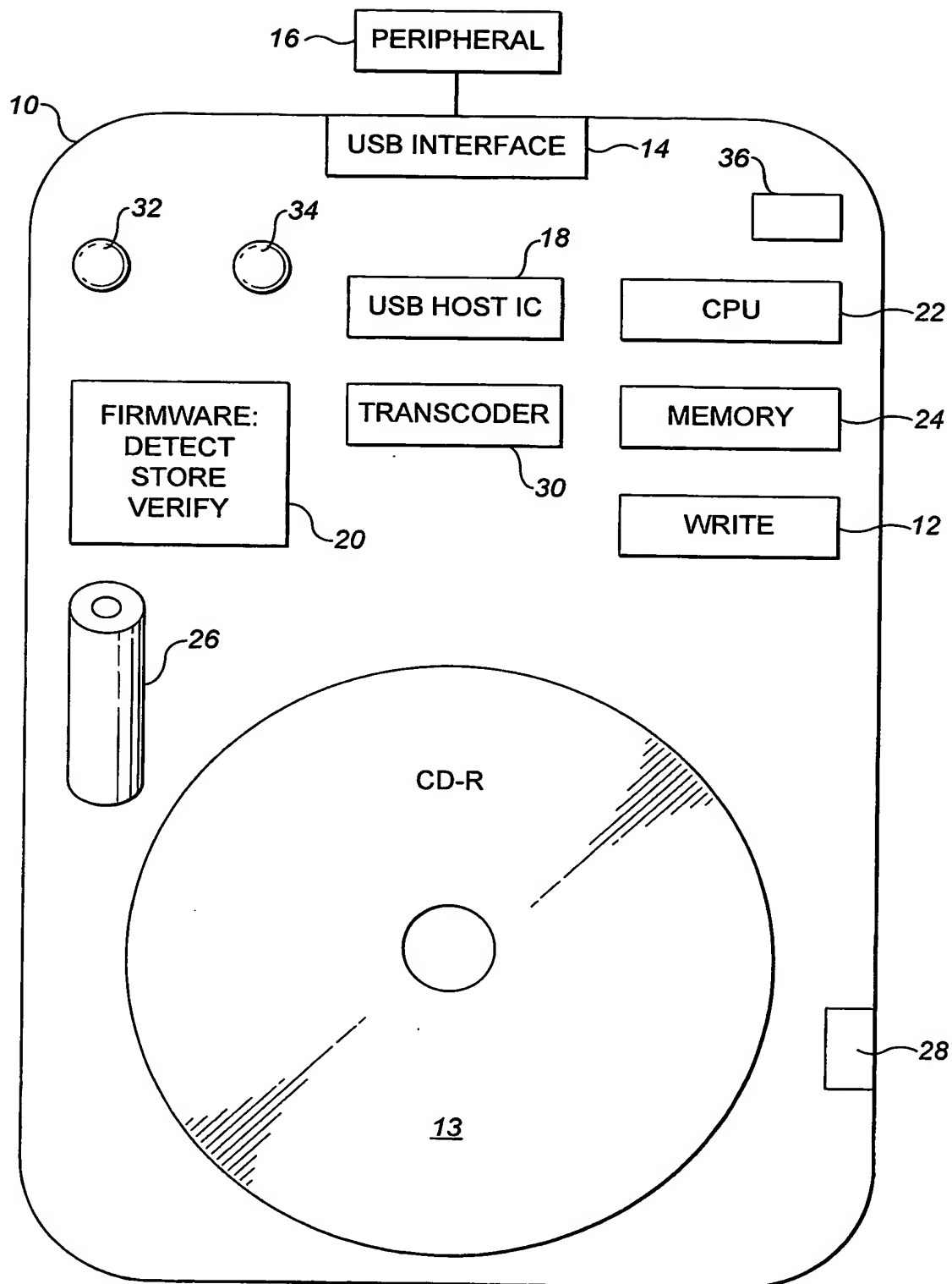
31

32 39. The method of any of Claims 24 to 38 wherein the
33 method further comprises the step of saving to the

1 storage medium the data received from the peripheral
2 device transcoded or copied directly into a plurality
3 of formats.
4

5 40. The method of any of Claims 24 to 39 wherein the
6 method further comprises the step of saving each format
7 as a separate session on a multi-session optical disc.
8

1 / 2

**FIG. 1**

2 / 2

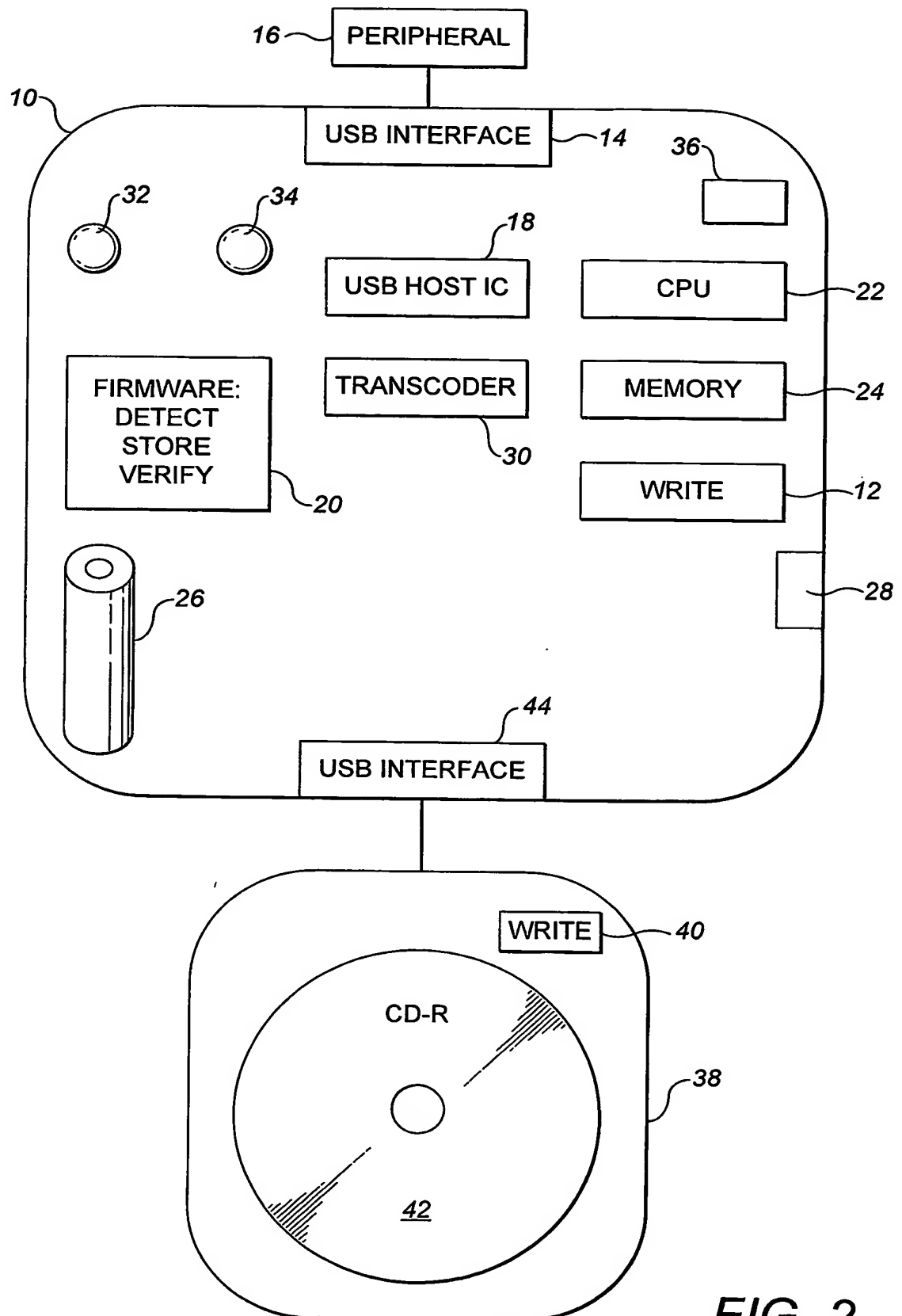


FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 03/04108

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G11B27/034 H04N1/21 H04N5/77

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G11B H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 03/04108

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